LMR16010PEVM User's Guide

The Texas Instruments LMR16010PEVM evaluation module (EVM) helps designers evaluate the operation and performance of the LMR16010 wide-input Simple Switcher® buck regulator. This document describes the setup and the input / output connections of the EVM. Included are the board layout, schematic, and bill of materials.

1 Introduction

The LMR16010 is a 60 V, 1 A step-down regulator with 40 µA quiescent current. With a wide-input range from 4.3 V to 60 V, it is suitable for a wide range of applications from automotive to industry for power conditioning from unregulated sources. The LMR16010PEVM evaluation board is designed to provide the design engineer with a fully functional power converter based on the buck topology to evaluate the LMR16010 series operation and performance.

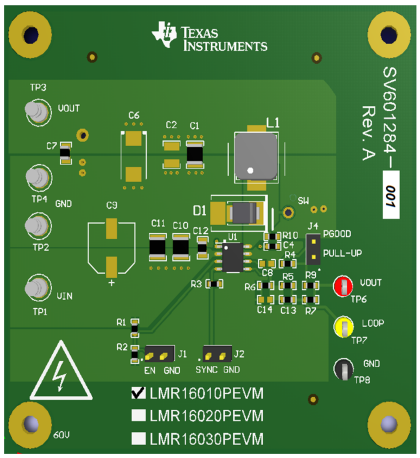


Figure 1. LMR16010PEVM Board

EVM Features

- 7 V to 60 V Input Voltage Range
- 5 V Output Voltage
- Up to 1 A Output Current
- Switching Frequency 700 kHz
- Power Good Flag Output
- Internal Compensation

NOTE: Risk of Electric Shock for Voltage Exceeding 50 VDC

Table 1. Device and Package Configurations

CONVERTER	EVM	IC	PACKAGE
U1	LMR16010PEVM	LMR16010PDDAR	SO-8

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2 Setup

This section describes the jumpers and connectors on the EVM and how to properly connect, set up and use the LMR16010PEVM.

2.1 Input/Output Connector Description

VIN — Terminal TP1 – is the power input terminal for the converter. Adjacent to it is the GND reference ground. Use this terminal to attach the EVM to a cable harness.

VOUT — Terminal TP3 – is the regulated output voltage for the converter. Adjacent to it is the GND reference ground.

GND — Terminal TP2, TP4 – are the ground reference for the converter. Use these terminals to attach the EVM to a cable harness.

EN — Jumper J1 – is used to enable the switch-mode converter. The device will be enabled when the respective jumper is high or floating, and disabled when low. EN turn on trip point also can be programmed by changing R1 or R2. Refer to LMR16010 datasheet for enable and adjustable under-voltage lockout.

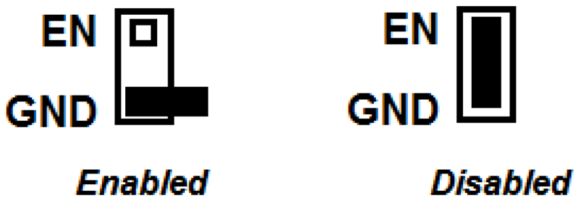


Figure 2. Enable Jumper Setting

SYNC — Jumper J2 – is used to synchronize the switching frequency to external clock. Refer to data sheet for detail application information.

PGOOD — Jumper J4 – is used to monitor the Power-Good flag. This flag indicates whether the outputvoltage has reached its regulation point. The U1 PGOOD pin is an open-drain output that requires a pullup resistor to the appropriate logic voltage (any voltage less than 7 V). A pre-installed resistor R4 of 10.2 kΩ is tied to the PGOOD pin and R9 of 49.9 Ω brought out to J4 PULL-UP pin.

Testpoint — TP6, TP7, TP8 – these are test points used for loop response measurements.

2.2 Adjusting the Output Voltage

The default setting output voltage is 5.0 V.

If other outputs need to be configured, then adjust the feedback resistors using the following equation.

$$V_{OUT} = V_{FB} (1 + (R5 / R6)) \quad (1)$$

Where V_{FB} is 0.75 V

CAUTION: R9 must be removed if the output voltage is changed higher than 7 V.

3 Board Layout

Figure 3 to Figure 6 show the board layout for the LMR16010PEVM. The PCB consists of a 4-layer design. 2-oz copper planes are applied on all four layers to dissipate heat with an array of thermal vias under the thermal pad to connect to all four layers.

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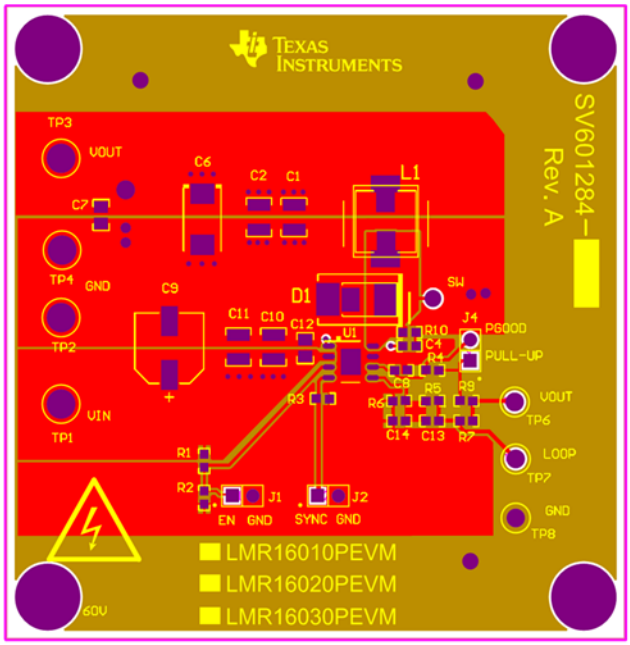


Figure 3. Top Layer

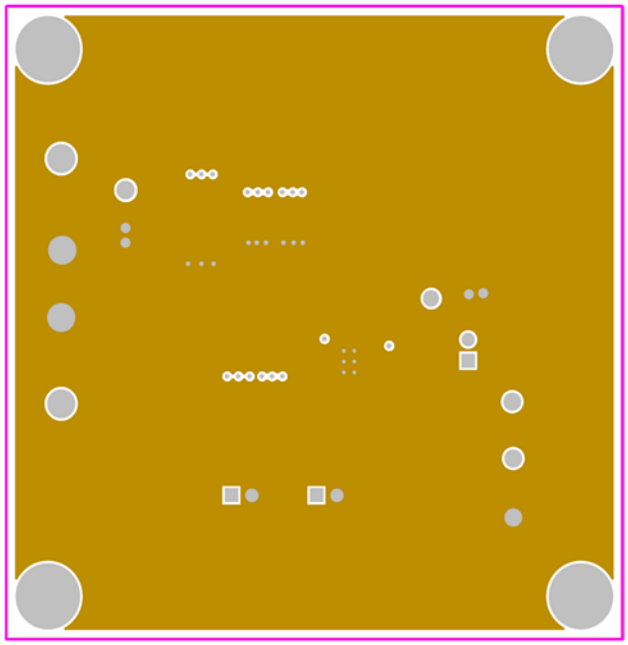


Figure 4. Middle Layer 1

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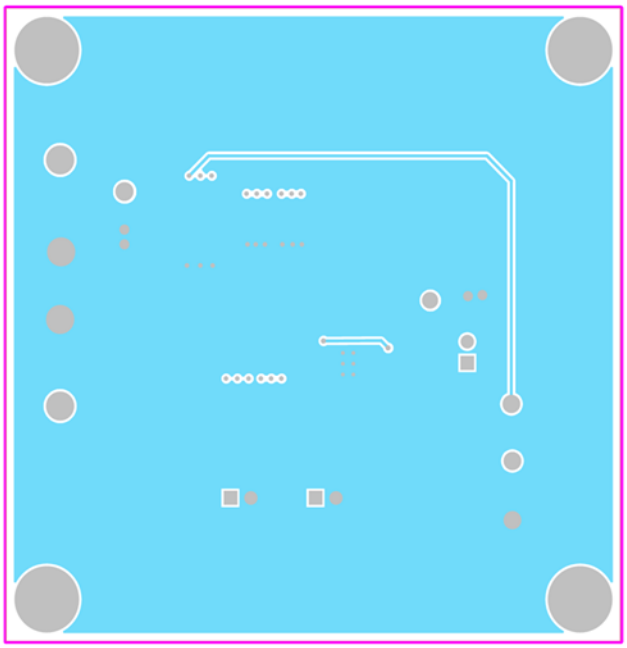


Figure 5. Middle Layer 2

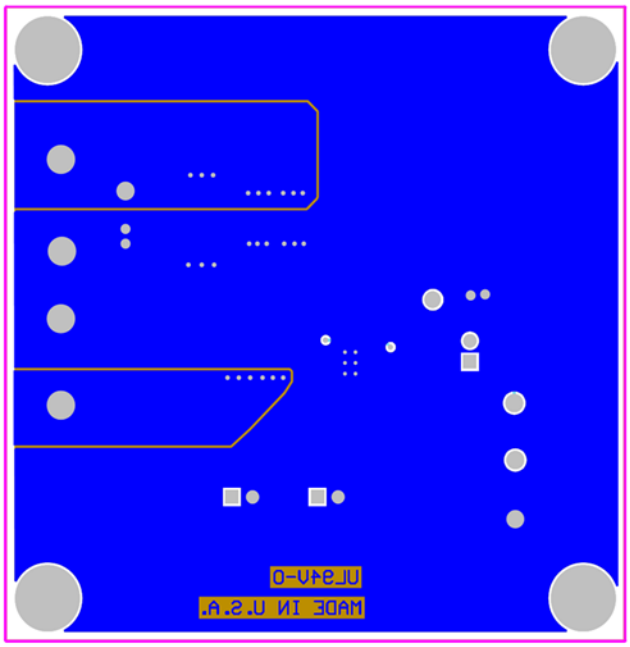


Figure 6. Bottom Layer

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4 Schematic and Bill of Materials

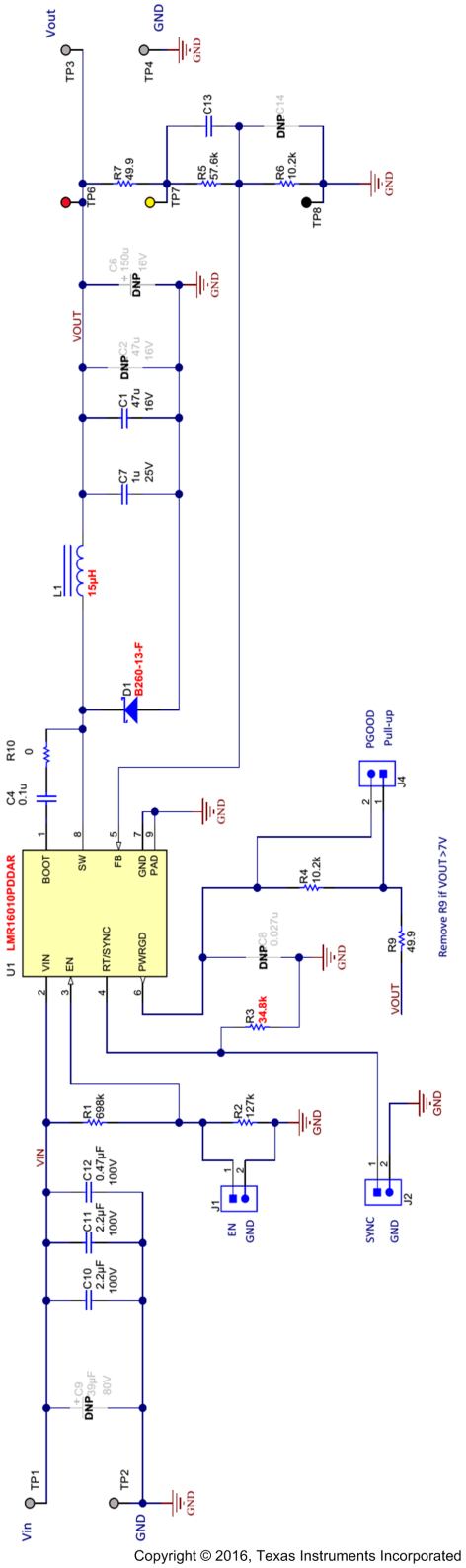


Figure 7. LMR16010PEVM Schematic

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Table 2. LMR16010PEVM Bill of Materials (BOM)

Designator	Description	Part Number	Footprint	Quantity
C1	CAP, CERM, 47 µF, 16V, +/-20%, X5R, 1210	GRM32ER61C476ME15L	1210	1
C4	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0603	GRM188R71C104KA01D	0603	1
C7	CAP, CERM, 1 µF 25 V, +/- 10%, X7R, 0805	GRM21BR71E105KA99L	0805	1
C10, C11	CAP, CERM, 2.2 uF, 100 V, +/-10%, X7R, 1210	GRM32ER72A225KA35L	1210	2
C12	CAP, CERM, 0.47 µF, 100 V, +/- 10%, X7R, 0805	GRM21BR72A474KA73L	0805	1
C13	CAP, CERM, 33 pF, 50 V, +/- 5%, C0G/NP0, 0603	C0603C330J5GACTU	0603	1
D1	Diode, Schottky, 60 V, 2 A, SMB	B260-13-F	SMB	1
J1, J2, J4	Header, 100 mil, 2x1, Gold, TH	TSW-102-07-G-S	TSW-102-07-G-S	3
L1	Inductor, 15 uH, 1.6 A, 0.07 ohm	7447779115	WE-PD-M	1
R1	RES, 698 k, 1%, 0.1 W, 0603	CRCW0603698KFKEA	0603	1
R2	RES, 127 k, 1%, 0.1 W, 0603	CRCW0603127KFKEA	0603	1
R3	RES, 34.8 k, 1%, 0.1 W, 0603	CRCW060334K8FKEA	0603	1
R5	RES, 57.6k, 1%, 0.1W, 0603	CRCW060357K6FKEA	0603	1
R4, R6	RES, 10.2 k, 1%, 0.1 W, 0603	CRCW060310K2FKEA	0603	2
R7, R9	RES, 49.9 ohm, 1%, 0.1W, 0603	CRCW060349R9FKEA	0603	2
R10	RES, 0 ohm, 5%, 0.1 W, 0603	CRCW06030000Z0EA	0603	1
SH-J1	Shunt, 100 mil, Flash Gold, Black	SPC02SYAN	SPC02SYAN	1
TP1, TP2, TP3, TP4	Terminal, Turret, TH, Double	1502-2	Keystone1502-2	4
TP6	Test Point, TH, Multipurpose, Red	5010	Keystone5010	1
TP7	Test Point, TH, Multipurpose, Yellow	5014	Keystone5014	1
TP8	Test Point, TH, Multipurpose, Black	5011	Keystone5011	1
U1	IC, 60 V, 1 A, Low I_Q, Current Mode, Buck Regulator	LMR16010PDDAR	SO-8	1
PCB	PCB, FR4, 4 Layers, Size 3000 x 3000 mil, Thickness 62 mil	SV601284A		1

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      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

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Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
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